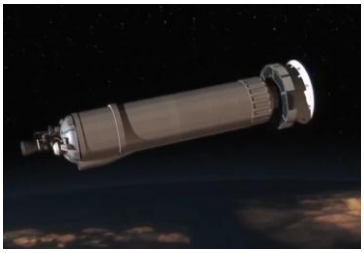


Centaur 50th Anniversary Engineering Design Challenge "Pushing the Limits"

Optional Classroom Activities and Resources

Classroom Activities

Air- Powered Mass

Student teams build a **mass car** and measure its movement in relation to the amounts of mass it carries as it is propelled by a uniform blast of air.. Following data collection, students graph and discuss their results and compare it to the video of a similar experiment performed on the International Space Station.
http://education.ssc.nasa.gov/pdf/mvw/MVW_Air_Powered_Mass_Activity.pdf

Rocket Races

Students construct balloon-powered racing cars using a foam tray and drinking straws. They then test the cars along a measured track on the floor. At the conclusion of the activity, students submit a detailed report on their racing design and how it performed in the trials.
http://www.nasa.gov/audience/foreducators/topnav/materials/listbytype/Rocket_Races.html

Newton Cars

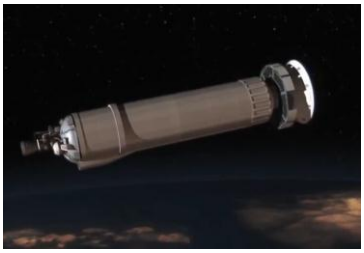
Student teams use a wooden car and rubber bands to toss a small mass off the car. The car, resting on rollers, will be propelled in the opposite direction. During a set of experiments, students will change variables. They will then measure how far the car rolls in response to the action force generated car.
http://www.nasa.gov/audience/foreducators/topnav/materials/listbytype/Newton_Car.html

Space Place: Make a Balloon Powered Nanorover

Design and build a robotic rover with cardboard and a balloon**.**
http://www.nasa.gov/pdf/544869main_E3_Nanorover_C2.pdf

Informational Resources

- Centaur: America's Workhorse in Space
  http://www.nasa.gov/centers/glenn/about/history/centaur.html
- Centaur Launched a Generation of Interplanetary Missions
  http://www.nasa.gov/centers/glenn/about/history/centaur_anniv.html
- Taming Liquid Hydrogen: The Centaur Upper Stage Rocket 1958 – 2002
  http://history.nasa.gov/SP-4230.pdf
- Engineering/Exploration Design Challenge Design Packet for Middle/High School



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http://www.nasa.gov/pdf/716281main_EDC_Design_Packet_6-12.pdf